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ABSTRACT

The concept of Delphi technique was presented in a computer-assisted instruction (CAI) module designed for educational administration classes or inservice training of administrators. Instructional Dialogue Facility (IDF) Author Language on a 2000F Hewlett-Packard time-sharing system was used to write the sequence. Instructional objectives, simulated exercise, tutorial material, and a pretest and posttest were developed. The module was field tested by 33 graduate students enrolled in an educational administration course, 16 of whom had no prior content knowledge. Results showed that the module actually produced learning as determined by pretest and posttest. Learning also indicated a favorable attitude toward CAI. It was suggested that this module could serve other uses and further development and testing of other such modules would be warranted. (Author/SC)

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Development of a Computer-Assisted Instruction (CAI) Program on the Delphi Technique

October 28-30, 1976

by

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ABSTRACT

The Delphi technique is a method for soliciting the informed opinions of selected experts and moving toward consensus through a series of questionnaires and feedback. An alternate instructional mode was needed for presenting Delphi technique concepts to people concerned with the administration of professional personnel. This was evidenced by the opinions of learners, observations of professors, and the lack of computer-assisted instruction (CAI) materials on the topic. Therefore, it was desirable to develop a CAI module to provide the means for people to learn about the Delphi technique, to make applications to personnel, and to experience interaction with the computer as it is used to assist in the educational process.

The major problem of this study was to develop and test the effectiveness of a unique CAI module for use in the teaching of Delphi technique concepts. Two purposes were identified: first, to develop unique CAI material for use in educational administration classes or in-service training of educators; second, to provide an alternate instructional mode for presenting Delphi technique concepts.

Research was conducted principally at The University of Iowa Computer-Assisted Instruction Research Laboratory. Instructional Dialogue Facility (IDF) Author Language available on a 2000F Hewlett-Packard time-sharing system was used to write the Delphi sequence.

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Tutorial and simulation CAI modes were used for development of an instructional module. Instructional objectives for the module were developed, a simulated hypothetical Delphi exercise was created and tested, a pretest and posttest were devised, and tutorial material was written.

Graduate students enrolled in educational administration courses participated in large-group testing of the module under conditions for which it was designed. Of the 33 participants, 16 indicated having had no prior knowledge of Delphi technique concepts. Learning effectiveness as a result of the Delphi module was determined through use of a pretest and posttest. Statistical and summary data support the statement that exposure to the Delphi CAI course actually did result in learning. In addition, learners indicated that it was an enjoyable experience, reinforcing the notion that people in general like CAI. Comments, suggestions, and item statistics were considered most valuable in that they offered the greatest source of information for module analysis and revision.

The Delphi module could be used as a tool at meetings and conferences and for short courses, workshops, and courses in other subject matter areas. Results of this study imply that further effort in developing and testing additional CAI modules is warranted.

MCCURDY, CAROL. DEVELOPMENT OF A COMPUTER-ASSISTED INSTRUCTION (CAI) PROGRAM ON THE DELPHI TECHNIQUE. A PAPER PRESENTED AT THE CONFERENCE OF THE NATIONAL ASSOCIATION OF USERS OF COMPUTER APPLICATIONS TO LEARNING, PORTLAND, OREGON, OCTOBER 28-30, 1976.

OVERVIEW OF THE DELPHI TECHNIQUE

The Delphi technique is a method for soliciting the informed opinions of selected experts and moving toward consensus through a series of questionnaires and feedback. It is one of the most flexible projection techniques available today.

Key characteristics of the Delphi technique are: 1) anonymity of survey panel members, the eliciting of individual and private responses from the participants to reduce the effects of socially dominant individuals; 2) statistical analysis; and 3) controlled feedback, which consists of sending iteration summaries to each participant. (3)

Through use of the Delphi technique, expert opinion is sought while eliminating face-to-face confrontation. Its goal is "to collect judgments and establish consensus about future probabilities in terms of such variables as time, quantity, and/or the desirability of some future state." (6) Contact with the experts is generally made through a series of questionnaires and feedback designed to elicit progressively more carefully considered group opinions.

COMPUTER-ASSISTED INSTRUCTION (CAI)

Educational applications of the computer have multiplied rapidly during the past few years. Not only is the computer being utilized for administrative applications (such as computerized scheduling, mark and attendance reporting, payroll, inventory), but the computer is applied increasingly to instruction.

The interactive capacity of the computer tends to monopolize the attention and to encourage full involvement of learners of all ages and grade levels. Computer use can bring to the educational process such attributes as absolute patience and objectivity, immediate feedback, extended dissemination availability, and student-paced individualized instruction programs. (7)

While some educators hesitate to experiment, research indicates that many others experience success and satisfaction with computer use. Indeed, effective computer utilization in the teaching-learning process includes examples representing practically all subject matter areas. (2,5,10) As implementation of computer applications continues to be supported where feasible, enlarged numbers of educators become involved in and committed to computer-assisted instruction (CAI).

PROBLEM/PURPOSES OF THE DELPHI STUDY

As evidenced by the opinions of learners, observations of professors, and the lack of computer-assisted instruction (CAI) materials on the topic, an alternate instructional mode was needed for presenting Delphi technique concepts to people concerned with the administration of professional personnel. Therefore, it was desirable to develop a CAI module to provide the means for people to learn about the Delphi technique, to make applications to personnel, and at the same time to experience interaction with the computer as it is used to assist in the educational process.

The purposes, then, of the Delphi study were: first, to develop unique CAI material for use in educational administration classes or in-service training of administrators; and second, to provide an alternate instructional mode for presenting Delphi technique concepts.

GENERAL PROCEDURES

Research was conducted principally at The University of Iowa Computer-Assisted Instruction Research Laboratory. Tutorial and simulation CAI modes were used for development of an instructional module on the Delphi technique.

Tutorial instruction approximates teacher-student interaction; it is used to introduce a concept and to develop the student's skill in using it. Tutorial CAI material consists of a series of instructional frames. It is similar to printed programmed instruction except that the student works at a computer terminal and his/her responses are transmitted directly to the computer, which facilitates instantaneous and automatic feedback. After each response, the student can be branched to new instructional material which is especially designed to meet his/her individual needs. (8)

Computer-based simulation is "a technique for studying the behavior of complex systems by using a computer to manipulate the variables and observe the behavior of the model." (1) It is a hypothetical representation of situations occurring in the real world. Typically, the computer presents the learner with information about a real situation; the learner is then required to make some kind of decision based on this information. The computer examines the decision and presents a new set of facts, and the learner is required to make more decisions. This cycle is followed throughout the computer-based simulation exercise. (10) Essentially, the student learns by being placed in a situation where s/he must make decisions to achieve certain goals. Insight is gained by (a) examining and manipulating variables in a setting that simulates situations in real life and (b) assessing the consequences of the decisions made. (7)

After investigating the use of several computer programming languages, it was decided that Instructional Dialogue Facility (IDF) Author Language, which was available on a 2000F Hewlett-Packard time-sharing system, would be used to write the Delphi sequence. IDF's simplicity and potential for classroom use were key reasons for its selection.

Instructional objectives for the module were developed, the simulated Delphi exercise was created and tested, the pretest and posttest were devised, and the tutorial material was written. During the development period, several individuals made valuable comments which facilitated early module revisions. Upon completion of the program, individual testing took place. Revisions were made according to the author's personal observations and the performance, suggestions, and informal comments of the participants. Field testing was then conducted and revisions were again made, readying the program for classroom use.

Graduate students enrolled in educational administration courses participated in large-group testing of the module under conditions for which it was designed. Of the 33 participants, 16 indicated having had no prior knowledge of Delphi technique concepts. Learning effectiveness as a result of the Delphi module was determined through use of a pretest and posttest. Statistical and summary data support the statement that exposure to the Delphi CAI course actually did result in learning. In addition, learners indicated that it was an enjoyable experience, reinforcing the notion that people in general like CAI. Comments, suggestions, and item statistics were considered most valuable in that they offered the greatest source of information for module analysis and revision.

DEVELOPMENTAL PROCEDURE

Figure 1 shows the general instructional sequence developed in the Delphi technique module. More specific structure for development of the Delphi course was provided, with some modification, by the instructional model designed by Walter. (9) The 12 basic instructional design steps followed in the Delphi module development are represented in Figure 2:

1) A topic (the Delphi technique) was selected based on requirements of the target population and on needed understanding of the Delphi method.

2) The medium (CAI) and language (IDF) were selected for the purpose of communicating the instructional message to the learner.

3) Instructional objectives were stated.

4) A learning hierarchy was constructed by analyzing the tasks described in the instructional objectives.

5) The pretest and posttest were assembled from criterion items which were developed to measure whether or not an individual had acquired the specific behaviors described in each objective.

6) A flowchart illustrating the general instructional sequence was drawn showing every possible path a student could follow through the lesson segment and indicating the conditions which determine each path.

7) The learning activities designed to provide the student with the skills and knowledge necessary to attain each objective were developed and programmed using Instructional Dialogue Facility (IDF) Author Language.

8) Several people from the target population tested the lesson segment (small-group test); revision was made where necessary.

9) Step 8 was repeated.

10) The module was used with a group of 33 students from the target population under the conditions for which it was developed to determine if it teaches what it purports to teach (large-group test).

11) Results of the testing procedure were analyzed.

12) Additional module revision was made.

While the foregoing steps appear prescriptive, module revision was never-ending. Numerous revisions were made throughout the development process; more will undoubtedly be made in the future.

IMPLICATIONS

From the review of literature, it is apparent that use of the computer in the classroom is rapidly expanding. In practically all subject matter areas, effective computer utilization has been documented. Research indicates successful and satisfactory experience with computer applications at all levels of education.

The Delphi technique is a topic that is difficult to cover in a classroom setting because of its combined complexity and generality. The module allows learners to proceed through entire development of the concept without interruption. The simulated Delphi exercise was designed to introduce the whole picture before the relating of specifics. By repeating the simulation following instruction, immediate application of Delphi technique concepts reinforced the learning of lesson objectives.

As with any worthwhile teaching endeavor, a project of this nature requires a considerable amount of fortitude, a great deal of time, and a tremendous outlay of effort. Perhaps such a project could best be tackled by a team with each member contributing to the development of the final product. In order for development of this kind of material to be justified

in terms of time and/or cost effectiveness, wide module use must occur in a number of different situations and places.

The Delphi study strongly reinforced the notion that people in general like CAI. Exposure to the Delphi module was an enjoyable experience; learners felt that they had gained real knowledge and that going through the course was considered time well spent. Participants appreciated the presentation of a maximum amount of information in an acceptable amount of time. People were able to learn effectively without rote memorization, feeling belittled, or undue repetition.

Several learners indicated that the Delphi module was helpful to them and that they would recommend it to others. Some individuals even suggested possible uses such as its availability when a moving toward consensus is desired at meetings and conferences, for short courses, workshops, courses in other subject matter areas and other universities, and for quick reference when studying for comprehensive examinations.

Comments referring to the lack of tediousness and frustration associated with the Delphi module indicate a contribution toward the alleviation of fear of the computer among those unfamiliar with it and with its capabilities. Display of the learner's name at strategic points was an especially pleasing aspect of the Delphi module. Participants expressed surprise and delight at this personal touch from what they considered to be an impersonal computer.

Some of the specific implications suggest that further effort in the developing and testing of other such modules is warranted. Several additional administrative tools are compatible with possible instructional presentation via CAI. Another interesting approach would be to test the module among

groups of people with non-educational areas of interest, as well as areas of interest in education but outside that of educational administration.

In conclusion, this study represents a contribution toward positive CAI learning experiences and, therefore, helps to eliminate obstacles to effective future use of the computer for instruction. Experiences such as this provide involvement with CAI; the potential commitment to CAI follows. By developing unique CAI material and providing an alternate instructional method for presentation of Delphi technique concepts, the stated goals of this study were accomplished.

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FIGURE 1. INSTRUCTIONAL SEQUENCE FLOWCHART
(FOR THE DELPHI CAI MODULE)

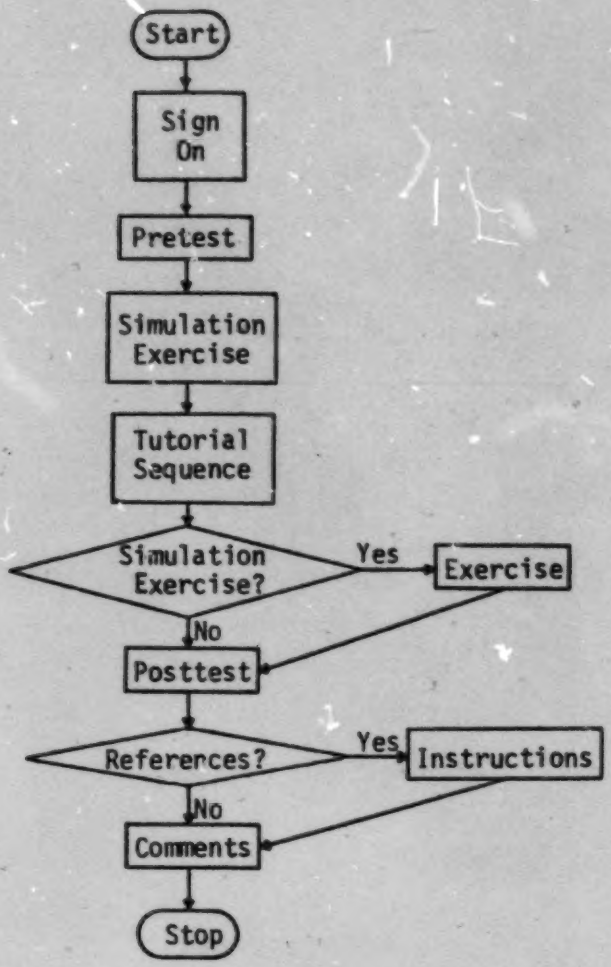

FIGURE 2. BASIC INSTRUCTIONAL DESIGN MODEL
(FOR THE DELPHI CAI MODULE)